The Citrus Industry

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FLORIDA STATE HORTICULTURAL SOCIETY

As this issue of The Citrus Industry goes to press, all is in readiness for the Fifty-Eighth Annual Meeting of the Florida State Horticultural Society to be held in Orlando on October 2, 3 and 4.

Postponed on account of limited travel conditions during the spring, when the annual gatherings are customarily held, the officers and directors of the Society took advantage of the relaxed transportation facilities to go ahead with the delayed meeting at the later date.

The program as published in this magazine last month is one of great interest and supreme importance to Florida citrus growers and other horticulturists of the state. Some of the papers prepared for delivery at the Orlando meeting will be found elsewhere in this issue and others will follow in succeeding issues.

The Florida State Horticultural Society has played an important part in the development of the citrus industry of Florida and has been a major factor in the eradication of plant diseases and pests which from time to time have threatened the industry. For more than half a century the Annual Meetings of the Society have highlighted the affairs of citrus growers. The best minds in the industry, state and national, have contributed the results of their experience and research, practical and scientific, for the enlightenment of growers. The meeting about to open in Orlando will deal with subjects now of such vital interest to growers.

With travel restrictions lifted, the Fifty-Eighth Annual Meeting should be well attended. The excellence of the program and the great interest in post-war problems should guarantee this result.

HURRICANE DAMAGE SLIGHT

Loss to Florida citrus growers from the hurricane of Sept. 15-16 was much less than had been feared. Remembering the heavy loss sustained in the hurricane of October, 1944, citrus growers nervously awaited the winds which had been heralded as of intense velocity. Fortunately, the storm had diminished materially before crossing the citrus belt.

Except in a few isolated areas the damage sustained by growers was small. Fort Myers and the Sebring-Avon Park sections were the heaviest losers. In those sections considerable damage was done to grapefruit groves and some trees were uprooted. Damage to orange groves was less severe. For the citrus belt as a whole, the injury is reported to have been inconsequential. There may be some slight loss from thorn-pricked fruit, but it is believed that this will prove to be of minor importance.

Driving from the Atlantic to the Gulf coasts, the storm passed well below the heavy citrus producing sections. Entering the state again from the Gulf near Fort Myers, the storm worked eastward toward the Ridge section, but by the time the citrus belt was reached, the winds had subsided to extreme gale force, again attaining hurricane velocity after crossing the state and entering the Atlantic near Jacksonville.

Florida citrus growers were extremely fortunate in escaping the full fury of the storm, which at times during its passage over extreme South Florida, attained a velocity of 143 miles per hour.

GOOD CROP ANTICIPATED

Florida citrus growers are awaiting the first official federal estimate of the 1945-46 citrus crop soon to be announced.

While few people are in position to make an accurate guess as to the probable volume of the crop, and the few who are showing no disposition to go out on a limb with definite estimate, it is the general opinion among citrus growers and shippers that the crop will be large. In spite of hurricanes, drought and other limiting factors, there is every appearance that trees are heavily laden with fruit of good quality.

The late bloom, coming in late June and July, has apparently developed far beyond early expectations. This, coupled with the fact that the normal bloom developed early, making possible the opening of the shipping season fully three weeks ahead of a year ago, will make for a much longer shipping season than normally. Already some shipments are being made, the fruit passing the inspection tests by a wide margin.

With government purchases practically at an end, care should be exercised in marketing, gluts in markets should be avoided and nothing but the best of fruit should be permitted to reach the fresh fruit consumer. The canning and concentrate plants will take care of the rest.

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Citrus Fruit Products Research[1/]

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Winter Haven, Florida, at Meeting of Florida State Horticultural Society, Orlando.

The opportunity of reporting on the work of the U. S. Citrus Products Station during the past year is greatly appreciated. During the year both the Department of Agriculture staff and the Florida Citrus Commission Research Fellows have devoted their efforts entirely to investigations on citrus products and byproducts. The work of the Station is directed toward more profitable utilization of citrus fruit as juice, sections, concentrates, marmalades, etc., and the profitable utilization of hyproducts of these operations. Improved methods of producing better quality products at lower costs increase the amount of the fruit that can be marketed in processed forms, thus stabilizing the markets and increasing returns to the growers.

The development of the citrus fruit products industry in Florida has been nothing short of phenomenal. In the short span of nine years the total canned pack has increased from 4,322,000 cases to 30,973,000 cases, better than a seven-fold increase. Few industries can boast of such an expansion. During this period there was slightly less than a three-fold increase in the total citrus crop and it is evident that a major portion of the increased production was taken by the canneries. Nine years ago a little less than one-third of the grapefruit grown in Florida was processed but now two-thirds of the crop goes to the canneries. During the same period processing of oranges has increaseed from about one-seventieth to one-fourth of the total crop. With the anticipated large increases in yield of citrus fruit in Florida, even larger percentages of utilization by processors and much larger of citrus products are to be expected. This trend was shown at the beginning of the past season, before the hurricane destroyed a large part of the crop, at which time processors were expecting to handle one-third more fruit than in the preceeding year.

At the present time large amounts of citrus fruit products are being purchased by the government. With the end of hostilities these purchases will be greatly reduced, and it will be necessary for the industry to sell even larger amounts on domestic markets. Quality of the products delivered will be one of the principal factors determining the total volume that can be sold. It is hoped that many of these returning from the armed services will want to continue to consume citrus juices in the quantity now being furnished them.

Interest in research on citrus products is by no means confined t Florida. An increased interest is being shown by almost all the citrus-producing sections of the world. Not only the other citrus-producing areas of the United States, but South America, the Mediterranean areea, and even China are planning for increased production and processing. There seems to be some shift in interest toward more fundamental information as a basis for improvement of processed products.

In this paper a brief review of the principal projects at the U. S. Citrus Production Station will be given and progress indicated. There will not be sufficient time however, to go into much detail. Major projects which have received attention during the past year include concentrated citrus juices, methods of peel oil determination, the fatty material of citrus juices, bacteriological work, and powdered citrus juice. As each phase of the work reaches an appropriate stage, results are published and reprints

1/Agricultural Chemical Research Division Contribution No. 164.

2/ One of the laboratories of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, U. S. Department of Agriculture.

are made available to all interested parties.

Concentrated Orange Juice: Large quantities of orange juice have been concentrated in Florida for shipment to Allied Nations where they have been rationed to small children and mothers. The concentrate has a high content of vitamin C and very valuable for this reason. However, it was found that in some cases gas formed in the cans and caused the cans to swell. Studies were undertaken to determine the cause of this difficulty.

Fig. 1—New shoots from axillary buds bearing both leaves and flowers. In this study termed "leafy" inflorescences. Flowers appear singly in leaf axils on "new wood."

It was not known whether the gas formation was due to micro-organisms or chemical breakdown; samples were prepared of pasteurized, unpasteurized and chemically preserved 65 degrees Brix-concentrated orange juice and stored at several temperatures. In some of the unpasteurized samples stored at room temperature fermentation developed rapidly and from this it was concluded that it is desirable to pasteurize the final concentrate as it is filled into the containers. However, this was not the whole story. When samples of chemically preserved or pasteurized concentrates were stored at room temperatures, within a few months sufficient gas developed to swell the cans. It is believed that in this case the gas was produced by the chemical breakdown of some of the constituents in the concentrate. At a temperature of 120 degrees F. sufficient gas production occurred to swell the cans in a few weeks. Carbon dioxide was found to be the principal constituent of the gas which formed in the swelled cans, regardless of whether chemical decomposition or microbiological fermentation had taken place. Chemical analyses were made of the concentrates, both before and after storage, and included reducing and non-reducing sugars, titratable acidity, vitamin C (ascorbic acid) and pectin as pectic acid. Comparisons of color and flavor were also made. It was found that the vitamin C disappeared very rapidly at 120 degrees F. and was quite stable in cold storage at 35 degrees F. Storage of concentrates of this strength at room temperatures or above for more than brief periods of time is likely to affect the vitamin C content adversely.

In general, it appears advisable to pasteurize the final concentrate and to kee pit under refrigeration in order to prevent gas production and less of ascorbic acid. The results of these experiments are to be published in detail shortly.

It is not known definitely which compounds decompose with the production of gas at elevated and room temperatures. Some studies are being conducted in an effort to determine the influence of some of the constituents on gas production as well as on darkening of the product. The information obtained so far has not been very conclusive. A number of compounds may be involved. The sugars appear to be responsible for some of the gas production under the influence of the acid present. Ascorbic acid seems to play some part but it is not clear whether it actually decomposes with the production of gas or acts as a catalyst. The actual weight of gas required to swell a can is quite small and there are a number of compounds present which could easily produce that amount.

The Florida Citrus Commission Research Fellows have been investigating the production of concentrated citrus juices and have developed some very interesting products. During the past season equipment has been installed which permits concentration under a wide range of conditions. Concentration under vacuum at temperatures as low as 45 degrees F. is now possible in reasonable length of time. Samples of Pineapple and Seedling oranges have been prepared under vacuum at temperatures ranging from 45 degrees F. to 120 degrees F. and these are to be compared with samples prepared from the Valencia variety. These samples are to be placed in storage at various temperatures and observations made of the effect on the quality of the concentrates. Bacteriological studies are to be made on the juice during concentration and during storage.

In addition to the regular concentrates just mentioned the Citrus Commission Research Fellows have been working on some special concentrates with very good possibilities. Concentrated orange juice made by the usual vacuum concentration process is practically devoid of the aroma so characteristic of fresh juice. These aromatic fractions are naturally removed during the vacuum concentration processes along with the water vapor. It has been found that by adding some fresh juice to the concentrate a product is obtained of medium concentration which can readily be reconstituted to make a juice which is difficult to distinguish from fresh juice. Some of the lots have been prepared by diluting concentrates of about 60 degrees Brix to 45 degrees Brix, but other combinations may be used. It is felt that this concentrate will retain its flavor for considerable length of time if stored in a frozen condition at 0 degrees F., but tests are being made to determine this as well as the storage life at 35 degrees F. and higher temperatures. If stored in a frozen condition it can be used directly to prepare juice simply by adding the required amount of tap water. The water will melt the concentrate, the

water will be cooled, and a cool drink obtained. This should appeal particularly to restaurant and soda fountain propietors since the product can be dispensed rapidly without going to the trouble of squeezing fresh fruit. Application is being made for a public service patent covering the process so that it will be available to all without charge.

Peel Oil: Standards have been established by the Office of Marketing Services for the amount of recoverable oil in citrus juices. These standards have been established on the grounds that excessive amounts of peel oil impair the flavor of the juice and favor the development of terpene flavors during storage. Difficulty has been expressed by some workers in obtaining consistent results. A considerable amount of time has been spent by the Bureau of Agricultural and Industrial Chemistry checking the Clevenger apparatus now in general use and devising new apparatus. The present apparatus will give satisfactory results if proper precautions are taken, but if the operator is careless or in a hurry there is danger of loss of some of the oil and low results will be obtained. Plant operators naturally want results quickly on the juice going through their plants. In order to speed up the determination an extra amount of heat is often applied in bringing the juice to a boil and if care is not taken to reduce the heat as boiling starts there will be a loss of oil from the top of the condenser since a large portion of the oil distills during the first minute or so.

It is believed that the method can be made more fool-proof and more rapid by substituting a conventional Liebig or a West-type condenser for the cold finger type now in use and that the hot vapors should enter the top of the condenser instead of the bottom so that steam does not come in contact with the oil layer in the trap and constantly redistill it. Apparatus for carrying this out has been devised.

Fatty Material in Citrus Juices: In 1940 A. J. Molte and H. W. von Lossecke (8) published some work on the petroleum either soluble material in orange juice. They obtained evidence indicating that at least a portion of the off-flavors which developed in canned orange juice was due to oxidation of the fatty material in the juice. This work has been of much interest and an effort is being made to expand it and put it on a more quantitative basis. A new method of separating the oils has been developed which will be of considerable value. It consists of removing these materials from the juice with filter aid and then extracting them from the filter aid with solvents. The solvent is evaporated and the material is then available for further study. This method removes practically all the fatty material and is more quantitative than the centrifuging method used previously. This procedure is to be used in a study of the fate of the fatty constituents in citrus juice and in devising means of controlling the amounts present.

Bacteriological Studies: During the past year basteriological studies have been expanded. A considerable number of bacteriological counts were made in typical citrus juice plants during operation in order to obtain information on the types and numbers of organisms present in the various steps of processing. Isolations were made of typical organisms and samples of juice were prepared and bottled with varying numbers of these organisms present before pasteurization. Samples of these juices were examined after three months' storage, and even though the organisms were killed during pasteurization some indications were obtained that they can adversely affect the flavor of the finished product.

The disposal of citrus waste liquors is still a serious problem and ways and means of utilizing as well as disposing of them are urgently needed. Efforts are being made to find other organisms that will utilize these wastes more completely and produce useful products.

It is a pleasure to note that two processes which have been suggested by the Citrus Products Station have come into commercial use during the past year. These are the production of feed yeast from waste liquors from citrus processing plants and the manufacture of alcohol from the citrus-waste press juice. It is believed that these developments are very significant and it is hoped that there will be more developments along these lines. It is believed that the possibilities of producing feed yeast of high protein and vitamin contents are particularly good.

Fig. 2—Purely floral growth from axillary buds, consisting of flowers unaccompanied by new leaves. Bloom of this type is commonly said to be on "old wood."

Tangerine Products: The article published last year on "Tangerine Juice Products" (1) covering work by the Florida Citrus Commission Research Fellows has attracted wide attention particularly by the bottlers of carbonated beverages. Many inquiries have been received asking for information on the nature of the sirup and beverage bases prepared, samples and possible sources of supply. There appears to be a market here for at least a portion of the tangerine crop.

Powdered Citrus Juice: Some work has been done by the Florida Citrus Commission Research Fellows on the production of powdered citrus juices with the vacuum-drum drier.

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The Set of Sweet Orange Fruit In Relation To The Type of Bloom

PHILLIP C. REECE
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A detailed study of the flowering and fruiting habit of the sweet orange has yielded interesting and potentially very important data on the relative fruit set which can be expected from bloom on the "new wood" as apposed to the on "old wood." While grower opinion concerning the relative merits of the two types of bloom is divided, it is most commonly thought that flowers on the "old wood" are stronger and more likely to set a good fruit crop. Contrary to this general belief, evidence is herein presented which shows that bloom on "new wood" is far superior for fruit set in the case of the sweet orange.

Extension of branch development, including flower production, takes place by growth from axiliary buds, since in a true morphological sense there are no terminal buds in citrus. At flowering time some of these axillary buds, present on a flush of growth of the preceding season, elongate into leafy shoots without flowers, while others may give rise to very short laterals bearing one or more flowers but without leaves. These two types of growth represent the extremes of purely vegetative and purely floral development. Between these extremes, some buds develop into shoots bearing both leaves and flowers, the flowers appearing singly in the axils of the leaves on the new growth. This is spoken of as bloom on the "new wood" (fig. 1). When the growth from the buds is purely floral, that is, consisting of flowers unaccompanied by new leaves, the bloom is said to be on the "old wood" (fig. 2). Usually both types of blooms are present, and frequently they appear on the same branch (fig. 3). However, the proportion of "old wood" and "new wood" bloom varies greatly, and a predominance of one or the other in general type of bloom characterizes a tree. The term "old wood" bloom is of course inaccurate because in all cases the flowers are on new wood, although this fact is frequently not apparent because the axes on which the flowers are borne are very short and leafless.

In this paper the term "inflorescence" will be used in a very broad sense, to cover any type of floral development which may appear from a given axillary bud. The inflorescence will be referred to as "leafless" if the growth consists of one or more flowers but without leaves, and "leafy" if the flowers are axillary on new leaf shoots. Intergrading types exist in which the development is chiefly floral but with only one or two leaves present upon the general stalk along which the flowers are disposed. These forms have arbitrarily been classed as "leafy" inflorescences.

The trees used in this study are on rough lemon roots in the Isleworth grove of the Chase Investment Company, to whom we are indebeted for their cooperation. This grove is maintained in good condition and produced satisfactory crops in the seasons of this experiment. In the spring of 1943 one hundred branches for the Pineapple variety and three hundred forty of the Hamlin were tagged, and the number of flowers from each axillary bud was recorded at flowering time. Subsequent counts were made periodically during the growing season to determine the percentage of fruit set. In 1944 the study was extended to include Valencia, of which variety four hundred branches were used. Thus the data which follows covers the flowering and fruiting behavior in two separate years. The similarity of the results in the two seasons, even though with different varieties, will be apparent.

In table 1 the average number of flowers per inflorescence produced

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Harry L. Askew

In the death of Harry L. Askew of Lakeland the Florida citrus industry loses a prominent and able leader. For many years connected with the industry as grower and head of numerous citrus organizations, as a member of the Florida Citrus Commission, Harry Askew had been an untiring leader in every movement for the advancement of the industry and the welfare of the growers. His death is a distinct loss to the industry which will be felt in all citrus circles.

CITRUS FRUIT RESTRICTIONS TERMINATED

The U. S. Department of Agriculture has announced termination of four War Food Orders which regulated the distribution and sale of both fresh and processed citrus fruit.

Issued to facilitate meeting military and Government requirements, the orders are no longer considered necessary, as the end of the war with Japan has reduced these needs.

The orders terminated are: WFO 3, issued January 5, 1943, covering manufacture and sale of citrus fruit juice; WFO 6, issued January 12, 1943, covering citrus fruit required to be set aside for essential War needs; WFO 118, issued November 28, 1944, in connection with the processing of grapefruit segements; and WFO 122, issued January 17, 1945, covering disposition of canned grapefruit juice, canned orange juice, and canned grapefruit and orange juice blended.

Termination of all four orders was effective August 27, 1945.

SOIL CONSERVATION PRACTICES

"Florida Handbook of Conservation Practices" has just been issued by the War Food Administration, Agricultural Adjustment Agency, Southern Division. This pamphlet contains a complete review of conservation practices, together with the allowances for any farm undertaking any of the soil conservation practices provided for by the agency.

H. G. Clayton, Florida College of Agriculture, University of Florida, Gainesville, administrative officer in charge of the work in Florida, states that approximately $2,900,000 of assistance is expected to be available under this program to Florida growers for carrying out soil-building practices.

Mr. Clayton urges full use of the practices outlined in the handbook, asserting that such a program will make Florida farms much more productive.

CITRUS FRUIT PRODUCTS RESEARCH

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No entirely satisfactory product has been obtained, but several were prepared that have some interesting possibilities and leads have been obtained which will be useful in further work.

Flavor Recovery: The Eastern Regional Research Laboratory of this Bureau has had remarkable success in designing equipment for use in the preparation of concentrated apple flavor. Concentrations of the flavor as high as 150-fold have been made and these have proven to be very useful in restoring the flavor to apple concentrates. This equipment has been sent to the Winter Haven Station and is to be used in experiments on the recovery of the aromatic fractions of citrus juice. It is believed that the process has possibilities of application to both single strength and concentrated juices.

Recent Publications: A number of publications have been issued by the Citrus Products Station during the past year. An article entitled "Changes Occurring in Orange and Grapefruit Juices During Commercial Processing and Subsequent Storage of the Glass-and Tin-Packed Products" by B. L. Moore, E. Wiederhold, and C. D. Atkins, (6) discusses the relative merits of glass and tin containers. Both types of containers are satisfactory, but the storage life is generally a little longer in tin than in glass.

The article, "Recovery of Flavoring from Persian Limes—Preliminary Experiments", by C. D. Atkins, E. Wiederhold, and J. L. Heid (2) gives approximate yields and information on the characteristies of Persian lime oil.

The survey work on the retention of ascorbic acid has been completed and the second article entitled "Ascorbic Acid Retention in Florida Grapefruit Juices. II, During Storage of the Canned Products" by E. L. Moore, B. Wiederheld, and C. D. Atkins (7) has been published. The average retention of ascorbie acid was approximately 95 percent for two months, 90 percent for four months, and 83 percent for six months storage at the prevailing room temperature. Their previous paper has shown an average retention of 97 percent of the ascorbie acid during the juice canning operations. These results are very important since they show that substantial amounts of this vitamin are retained in the juice during processing and storage.

An article, "Papaya Products," by J. L. Heid and A. L. Curl (4), based on previous work, gives considerable information on the proparation of a number of papaya products.

A paper entitled "Comparison f Methods for the Determination of Moisture in Dehydrated Vegetables" by A. L. Curl (3) appeared during the year. It presents comparative information on vacuum over, benzen distillation, and toluene methods for determining moisture.

An article entitled "The Citrus Canning Waste Disposal Problem in Florida" by R. S. Ingols (5) gives a general review of the waste disposal situation and suggests solutions to some of the problems encountered.

It is believed that the U. S. Citrus Products Station at Winter Haven, Florida has made substantial contribution to the knowledge of citrus products during the past year and it is hoped that even more valuable information will be obtained in the future.

Fig. 3—A citrus branch on which both leafy and leafless inflorescences are present.

References

1. Atkins, C. D., Moore, E. L., adn Heid, J. L., "Tangerine juice products." Fruit Products Journal 23. No. 5 132-134, 152 153, 157 (1944).

2. Atkins, C. D., Wiederheld, E., and Heid, J. L., "The recovery of flavoring oil from Persian limes.—Preliminary experiments," Fruit Products Journal 23. No. 10, 306-8 (1944).

3. Curl, A. L., "Comparison of methods for the determination of moisture in dehydrated vegetables", The Canner 28, No. 23, 22-23 (May 6, 1944).

4. Heid, J. L., and Curl, A. L., "Papaya products", Fruit Products Journal 24. No. 2, 41-44, 53 (1944).

5. Ingols, R. S., "The citrus canning waste disposal problem in Florida", Sewage Works Journal 17, No. 2, 320-30 (1945).

6. Moore, E. L., Wiederhold, E., and Atkins, C. D., "Changes occurring in orange and grapefruit juices during commercial processing and subsequent storage of the glass-and tin-packed products',, Fruit Products Journal 23, No. 9 270-5, 285 (1944).

7. Moore, E. L., Wiederhold, E., and Atkins, C. D., "Ascorbic acid retention in Florida grapefruit juices. II. During storage of the canned products." The Canner 100. No. 8, 55-57 (January 20, 1945).

8. Holte, A. J., and von Loesacke, H. W., "Chemical and physical characteristics of the petroleum ether soluble material of fresh and canned Florida valencia orange juice". Food Research 5, 457-467 (1940).

The Research Program... Of The Florida Citrus Commission

L. G. MacDOWELL

Research Director Florida Citrus Commission at Meeting of Florida State Horticultural Society, Orlando.

The research program of the Florida Citrus Commission has just completed its third and most active year. Projects initiated in the past are now beginning to mature and to yield definite results. In the following paragraphs certain of those more advanced propects will be discussed.

1. Frozen Citrus Concentrates

One of the most significant developments is frozen citrus concentrates. Because of their importance to the industry and also because a certain amount of confusion exists towards the products involved, these products, their inception, and their preparation will be discussed in some detail.

Early in the summer of 1943 the writer was drawn to the conclusion that certain inherent drawbacks which hindered consumption of frozen single-strength orange juice and conventionally prepared orange concentrates could be overcome by a judicious compromise of the two products. A concentrate was visualized which could be marketed as a frozen food. Such a concentrate would immediately surmount two serious obstacles, one of which confronted each of the two aforementioned products. The slowness at which frozen single-strength juice melted would be overcome because the water added to the frozen concentrate would furnish the heat necessary to melt the ice particles present. At the same time a cool drink would result. The most serious obstacle confronting conventional concentrates was the high temperature filling which was felt necessary to ensure a sterile product in a sterile container. A frozen concentrate would not have to be hot-filled, in fact probably would not have to be pasteurized at all.

(a). Freezing Concentration Method

With the above thoughts in mind, the Horticultural Laboratories of the Agricultural Experiment Station at Gainesville were approached with the view of experimentation along this line. It developed at this time that Dr. A. L. Stahl of these Laboratories had been working on a process which would remove the water from orange juice in the form of ice. This happy circumstance was made to order for the project in mind, and plans were made immediately to accelerate Dr. Stahl's work so as to determine the best concentrations for the final product and the best conditions for obtaining it by the process he was using.

A cooperative project was set up and during the 1943-44 season the Florida Citrus Commission furnished additional personnel and experimental equipment to the Experiment Station. The results obtained were so encouraging it was felt that the Commission would be justified in installing a pilot-plant to manufacture frozen concentrate by this **freezing concentration** method. This was done and during the 1944-45 season a pilot-plant was installed in Gainesville and is now in operation.

The **freezing concentration** process is essentially what the name implies. Water is removed from a solution, in this case a citrus juice, by freezing the solution and removing the water in the form of ice. This procedure may be continued until the eutectic point of the solution is reached, the eutectic point being the concentration at which water and dissolved solids are deposited simultaneously. This process has been known for many years and certain modifications of it were the subject of a patent as early as 1899. Numerous investigations have been made since that time, and it is hoped with the help of this knowledge and with modern machinery that the process can be modified so as to be commercially adaptable to citrus juices.

Private manufacturers in the state have been impressed by the final product, and in the late spring of 1944 one plant which had been set up in Orlando manufactured several thousand gallons of frozen orange concentrate by the freezing concentration method. During the past year, a similar plant was erected in Haines City.

(b). By Evaporation with the Addition of Fresh Single-Strength Juice.

In the early spring of 1944, it occurred to the author that a good quality frozen concentrate might be prepared by a modification of the vacuum evaporation method. This would permit the production of frozen concentrate by facilities already existing in Florida. Accordingly, orange juice was concentrated by low temperature evaporation to about 65 degrees Brix (7 fold), diluted with fresh orange juice to about 42 degrees Brix (4 fold) and the mixture frozen. Again, the frozen concentrate proved to be so good that experimentation in this method has been vigorously prosecuted during the past eighteen months. This portion of our research program is being carried out by the Florida Citrus Commission employees working at the U. S. Citrus Products Station, Winter Haven.

Many variations in production techniques have been tested during the past year, and the suitability of the various types of citrus fruits for this product have been investigated. Excellent products have been obtained from mid-season and Valencia oranges and from tangerines.

On the basis of the results to date it would appear that the best temperatures for concentration are below 80 degrees F. The juices used may also be pasteurized with hardly any detectable changes in the flavor of the product. If the juices are not pasteurized, the product

should be maintained at 0 degrees F. while in storage.

A public service patent has been applied for on this method of preparing frozen concentrate.

One manufacturer in the state has prepared over fifty thousand gallons of frozen orange concentrate by this latter method during the past season.

It will be seen from the above that frozen orange concentrate is being made by two entirely different methods, the only similarity being in the final frozen product. It is too early to say which method yields the better final product, and it may well be that the orange concentrate from the two processes will be indistinguishable. Whatever the outcome, the citrus industry has been presented, out of its own research, with an absolutely new citrus product that should meet with wide acceptance from the public. In fact, the frozen orange concentrate already marketed has made a very favorable impression.

II. Insecticides.

The work on the control of scale by oil sprays has progressed very satisfactorily in cooperation with the Citrus Experiment Station at Lake Alfred. Since much of this work is being presented in another paper in these PROCEEDINGS it will not be discussed in detail here. However, much fundamental information has been gathered and its application will make a real contribution to this problem.

III. Decay Control

This work has also been carried out in cooperation with the Citrus Experiment Station. Since the discovery of the fungicidal activity of thiourea by Childs and Ziegler, we have given much time to problem of adapting this treatment to the packing-house process. In addition, it has been found that 8-hydroxyquinoline sulfate exercises considerable control over the decay organisms peculiar to citrus fruits. These studies are continuing.

IV. Internal Quality Survey.

The internal quality survey begun in 1941-42 in cooperation with the Citrus Inspection Bureau has been brought to a conclusion. The results from the analyses on many thousands of samples are now being compiled and will yield an accurate cross-sectional picture of the fruit produced in this state during the past four years.

In conclusion, it should again be pointed out that the topics discussed here do not include the whole of

(Continued on next page)

Control Of Grasshoppers In Groves & Gardens

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Fall is the season when grasshoppers are liable to do their worst. This is chiefly for two reasons. At that time species are approaching or have attained their full size and consequently eat more; in the second place the slackening of the summer rains and the approaching fall drought as well as the maturity of grass and other plants on which they mostly feed, drive the grasshoppers to cultivated lands where the vegetation is more tender. An exception to this is the lubberly locust, the largest grasshopper in Florida, which, however, has their wings too short for flight lubberly locust have mostly laid eggs and died of old age.

The word "locust," by the way as it is commonly used, is a little ambiguous. Strictly speaking. Florida "grasshoppers" should be called locusts, and the so-called Seventeen Year locusts and their relatives should be called cicadas, and not locusts. They are very different insects.

The control of grasshoppers is best effected by a poisoned bait. Mix up thoroughtly a pound of Paris green, or one and one half pounds of calcium arsenate with twenty-five pounds of bran. Moisten this with about two and a half gallons of water, in which has been placed a small handful of salt and a quart of molasses.

This bait should be put out in the evening, after the heat of the day. Grasshoppers do most of their feeding in the early morning, and the poisoned bait should be on hand for their breakfast. It should be sowed broadcast over the land, and twenty-five pounds of bran should be sufficient for about five acres of ordinary crops. In some cases, where the grasshoppers are very numerous and the vegetation is heavy, more will be needed. Instead of twenty-five pounds of bran, some growers prefer twelve and a half pounds of cotton seed meal and an equal amount of bran. This makes a bait with a little more stickiness which is advisable in some situations. The mixture of bran and Paris green will keep for some time in a dry place and a considerable amount may be mixed and stored for use. But every precaution should be taken to keep this out of reach of stock and children and careless persons.

Grasshoppers are apt to be particularly destructive at this time of the year in young citrus groves and gardens. They may strip off the leaves of the trees to such an extent as to seriously interfere with growth, and occasionally they may injury the fruit. They also are very destructive in gardens. Besides spreading the poisoned bait, another important measure in young groves and often the only one necessary, is to keep the cover crop down, either by mowing or disking. This exposes the grasshoppers to their numerous enemies such as shrikes, small hawks, and many other birds. Grasshoppers are always more destructive in groves where grass is high, particularly if it is as high as the tree.

The grasshopper baits are also effective against other members of the grasshopper tribe, that is the orthoptra, including katydids and crickets. Katydids are seldom numerous enough in a tree to do real damage but they sometime seriously mark trees. Crickets have been known to damage trees. This has usually been when a heavy cover crop which has lain on the ground for some time, has just been disked or plowed under.

Mowing the cover crops also has a tendency to drive away another serious pest of young citrus trees, —namely rabbits, by exposing them to their numerous enemies including hawks and owls.

THE RESEARCH PROGRAM OF THE FLORIDA CITRUS COMISSION

(Continued from preceding page) the Commission's research program, but rather only those projects which are near enough completion to be considered of economic value to the industry.

Transplanting Large Citrus Trees---

By A.F. Camp, Vice-Director in Charge Citrus Experiment Station, in "Citrus Industry of Florida."

The moving of large trees has be come increasingly popular during the last few years and considerable acreage has been planted in this way. When done on a considerable scale, operators advise that they can transplant 10 to 15-year-old trees at from $1.00 to $1.50 per tree. While it involves considerable work, the large trees will come into bearing much sooner than young trees. Generally, however, the transplanting of large trees is limited to replacements in groves and for yard plantings.

Large citrus trees can be transplanted very easily if the proper precautions are taken, and there is practically no danger of failure. The amount of root system to be transplanted will depend upon the facilities for moving the trees and the trees should be dug with as little damage to the root system as possible. As soon as the tree is dug the roots should be protected from drying out by wet burlap or other covering and kept protected until planted. The new hole should be large enough to contain the root system easily and should be dug just before the tree is planted so that it will not have a chance to dry out. If possible, the surface soil and subsoil should be kept separate and some well-decomposed compost and ground steamed bone meal should be added to the soil as the tree is planted. Injuried roots should be pruned off. The soil should be placed about the roots so as to leave them in normal position and not bunched up. Water should be added as the soil is filled in; the soil should be made firm about the roots, and a heavy final watering given. The tree should be given plenty of water until it is thoroughly established.

Methods of digging trees vary considerably, but the following method has been found very convenient. After topping the tree dig a trench around it 18 to 24 inches deep, depending on the size of the tree, cutting all lateral roots. From some point in the trench dig deeply under the tree to cut the tap root at a level of two feet or more below the bottom of the trench. Then, by using a crane or by hand, loosen the tree so that it can be lifted from the hole. The new hole is excavated evenly to the depth of the trench used in removing the tree and a post hole digger or shovel used to make a hole in the center of it for the tap root. When the tree is let down into this hole the lower lateral roots will rest on undisturbed soil so that there will be less tendency for the tree to settle later. There is also less disturbance of the subsoil than in the ordinary methods of excavation.

Trees can be moved during the winter when they are fairly dormant, in which case care will have to be used in keeping them watered during the dry spring weather. Trees can also be moved at the beginning of the summer rainy season and will usually become established by win-

(Continued on page 21)

New Cotton Fabric Resists Mildew

A new modified cotton fabric that will not mildew nor rot and that has withstood burial in the ground for more than six months with insignificant loss of strength, has been developed by scientists of the United States Department of Agriculture.

This new material has the strength and appearance of ordinary cotton, plus the ability to resist the attack of rot-producing microorganisms. It is partially acetylated cotton which is somewhat related to rayon made by the acetate process. In contrast to the use of the usual preservative finishes on cotton, this new process does not cause discoloration of the fabric. It does not produce an ordor or cause the fabric to be sticky, and it does not make the fabric toxic, a great advantage where it is used for food sacks.

Dr. O. E. May, chief of the Bureau of Agricultural & Industrial Chemistry, says this new development promises to become useful in a wide range of purposes. It is particularly promising for use in making rot resistant bags for the packing of fruits, vegetables and other food products.

To test the rot resistance of this material some of the treated cloth and thread were buried in the ground and in especially prepared soil beds teeming with microorganisms of the kind that would have rotted ordinary cotton cloth within a week. The results showed that the treated cotton could remain buried under these conditions from six months to a year with very little loss of strength. Sandbags made from the acetylated cloth, sewed with similarly treated thread, and piled out-doors on the ground, were still intact after two years.

Reports Of Our Field Men . . .

WEST CENTRAL FLORIDA
E. A. (Mac) McCartney

The Hurricane that blew over part of Florida several weeks ago did some damage in parts of the state but we were very fortunate in this territory and I am very happy to report that we had absolutely no damage. Rains continue to be plentiful throughout this section and we have noted considerable new growth making an appearance during the past few weeks. This is a healthy indication as far as next year's crop is concerned. There is still considerable difference of opinion throughout my territory as to the amount of fruit we have on our trees at the present time. There is no question but what we have lost lots of the late June and July bloom but we still have a very nice crop of fruit and in the case of tangerines we just would not have had any of this fruit if we had not been fortunate enough to get the late bloom. Our fall application of fertilizer is getting under way a little earlier this fall than in most previous years but this is as it should be because of the extremely heavy rains that we have had during the summer months.

NORTH CENTRAL FYORIDA
V. E. (Val) Bourland

Usually growers have a chance to do a little relaxing during the hot summer months, but this summer was an exception due to the fact that we have been fighting citrus insects and diseases all summer. The combination of a hurricane and later an extreme drought upset all of our spray schedules and as a result we have been fighting rust mites, melanose and the general decline of trees all summer. However, I am glad to report at this time that we have our trees in excellent condition, and while our quality might not be quite up to standard we have a nice crop of fruit that should sell well on any market. There has been considerable activity shown by the on-the-tree fruit buyers and a number of large crops have been sold at very attractive prices. The recent hurricane did some damage in this territory— knocking off some fruit and of course more will drop as a result of thorn-pricks and the general hammering around that had to be withstood. Rains have been falling almost daily and we should now have ample moisture to carry us through the months of semi-dry weather that will follow.

HILLSBOROUGH & PINELLAS COUNTIES
C. S. (Charlie) Little

We have had so much rain this summer that quite a few roads are impassible at this time and have been that way for several weeks. Groves in many places are showing water damage so you can see that we were worried when we received news that the hurricane as approaching the citrus section of Florida. However, we were very fortunate as the wind blew very little and we did not get more than a couple of inches of rain. Fruit—even the early bloom—is slow in maturing this season but during the past few days have noticed quite a few packing house men with their testing kits, so except to see fruit start moving at an early date. Citrus insect pests have been active all summer and growers have been busy with spray machines every day that it was possible for them to operate. We are just beginning our fall application of fertilizer and apparantly this will be over by the middle of November as most growers are planning an earlier application because of heavy summer rains.

POLK COUNTY
J. M. (Jim) Sample

The recent hurricane did some damage in this County, and most of the fruit loss occurred in the ridge section where considerable grapefruit was lost and some orange loss. However from close observation it appears that the damage might not be as heavy as was at first thought. March seedles grapefruit was hit hardest, and growers were unable to do very much of a salvage job because of fruit being too immature. We are now hoping that we can get through the remainder of the hurricane season without further damage. Growers are now applying their fall application of fertilizer and while this is somewhat earlier than usual it is being done to keep the trees well fed following heavy rains during the summer that undoubtedly leached considerable soluble notrogen from the soil. Our trees are in excellent condition and when all blooms are considered we have a nice crop of fruit. There was considerable activity shown by the fruit buyers prior to the end of the war but since that time they have assumed the attitude of waiting to see just what will happen. Rust mites are still active and many growers are still using oil to get their scale insect under control.

SOUTHWEST FLORIDA AND HIGHLANDS COUNTY
Eaves Allison

Highlands County was probably the hardest hit section in the state by the recent storm as far as fruit damage is concerned. March seedless grapefruit suffered the heaviest loss with many growers estimating that their loss would be as high as 70 per cent. Oranges and tangerines suffered less damage, but the overall picture is pretty bad. The hurricane did very little damage in other sections of this territory. Heavy and continued rains in the Ruskin area have destroyed tomato and pepper seed beds and have delayed field operations to a considerable extent. Further south conditions have not been so bad, with less precipitation in the Palmetto-Bradenton-section. Celery plantings are proceeding as usual in the Sarasota area with favorable soil moisture conditions. Continued rains over this citrus belt have kept moisture conditions well up, with groves on low land beginning to suffer from too much moisture. Fruit is sizing up well with very little splitting to date. Rust mites are very active and it is essential that you keep a close check on these pests.

I've always said I'd ruther be lucky than rich . . . and that a few real good friends was worth a heap more than a lot of money . . . guess the recent hurricane made me think of this, for while the lower east coast was hard hit and some spots in central Florida felt the effects of the storm, the state as a whole was mighty lucky.

Accordin' to reports all of Florida was in for a beatin' that was goin' to be worse than the last one, but somehow or other the storm slowed up when it hit inland. The east coast had a lot of damage and in Highlands county growers of Marsh Seedless reckon they lost about 70 percent of their fruit, while other losses were also bad. Along the ridge around Frostproof, Lake Wales and Haines City there was considerable fruit loss, too, but in most other sections it was pretty light. Celery seed beds in the Okeechobee and Sanford sections was hard hit and avocados was hurt . . . but as a whole we'd say the state came out lucky.

These here research fellers is shore smart . . . down at the Vegetable Crops Laboratory at Bradenton they have developed a new variety of tomato that is what they call "resistant to fusarium wilt." This bad soundin' disease has cost growers hundreds of thousands of dollars 'cause it just couldn't be controlled. But this new tomato just don't pay any attention to the stuff and Dr. A. L. Harrison, plant pathologist at the Bradenton station says the new breed is not only immune from the disease but is equal to or superior in yield to the standard commercial varieties under disease free conditions. These research guys is shore goin' to change things . . . got medicine now that'll keep folks alive long after they ought to be dead and now the bugs and disease which works against plants and crops is goin' to be out of luck 'cause the researchers have outsmarted 'em.

Lee county has been experimenting with raisin' sweet taters and this year they 'spect to raise a $1,750,000 tater crop. Carl Houck, county agricultural agent figgers that Lee county farmers will be harvestin' 125 to 200 bushels of these sweet taters to the acre to the tune of a total crop of 500,000 acres. Beauty of it is these Lake county sweets will be ready for market in June, 30 to 60 days ahead of the rest of the country.

And now the USDA has announced a new kind of sugar cane for the Florida Everglades area. It's called C. P. 34/79 and will be released for plantin' this fall. It's said to compare very favorably with present leading varieties in yield of sugar and tonnage of cane per acre in all types of soil in the everglades, as well as in sand and muck soils in the Fellsmere area. The department says that from every practical point of view the new variety promises notable advances in sugar yield.

Great state, this Florida of ours!

Uncle Bill

THE SET OF SWEET ORANGE FRUIT RELATION TO THE TYPE OF BLOOM

(Continued from page 8)

by the leafy and leafless types is presented. The data discloses that in each variety studied the leafy inflorescences bore the larger number of flowers, Leafless inflorescences of the Pineapple variety bore an average of 3.6 flowers, while leafy inflorescenses bore 4.8 flowers, or 1.3 times as many as the former. In the Hamlin and Valencia vareties the leafy type bore 1.6 times as many.

The superiority of the leafy over the leafless inflorescences in fruit set is apparent in table 2, which shows the percentage of the two types which still carried fruit when the final counts were made in the fall. With all these varieties and regardless of flush the percentages of leafy inflorescences which bore fruit were very much higher than in the case of the leafless.

Data are presented in table 3 on the percentage of individual flowers which fruited on the two types of inflorescences. The percentage of fruit set is shown one month after flowering, before all drop was completed, and finally in the fall. After that time any further drop could be attributed to other factors unrelated to the problem under discussion. When the final counts were made, 9.9 percent of the Pineapple orange flowers of leafy inflorencences were bearing fruit, in contrast to only 3.4 precent on the leafless type. Thus a flower on a leafy inflorescence had 2.9 times the probability of maturing a fruit as a flower on a leafless inflorescence. The percentage of flowers to bear fruit in the Hamlins were 4.4 on the leafy and 2.3 on the leafless, or flowers of the first type did 1.9 times as well. For Valencias the set on leafy inflorescences was 8.1 percent as compared with 3.5 percent, or 2.3 times the set on leafless inflorescences.

Not only did a greater percentage of the flowers on leafy inflorescences produce fruit, but this type of inflorescence actually carried a greater number of flowers, as shown in table 1. Leafy inflorescences in the Pineapple orange, for example, had

TABLE 1—NUMBER OF FLOWERS PER INFLORESCENCE

	Varieties of Sweet Oranges					
	Pineapple		Hamlin		Valencia	
	Type of inflrs.		Type of inflrs.		Type of inflrs	
	Leafy	Leafless	Leafy	Leafless	Leafy	Leafless
No. of inflrs. counted	217	369	505	659	821	959
No. of flowers inflrs.	4.8	3.6	4.5	2.8	4.4	2.8

TABLE 2—PERCENTAGE OF INFLORESCENCES WHICH BORE FRUIT

		Varieties of Sweet Oranges					
		Pineapple		Hamlin		Valencia	
		Type of inflrs.		Type of inflrs.		Type of inflrs	
		Leafy	Leafless	Leafy	Leafless	Leafy	Leafless
First flush	No. of Inflrs.	97	150	354	535	568	543
	% which fruited	33.0	9.3	16.9	6.9	33.1	9.2
Second flush	No. of inflrs.	120	219	151	124	253	416
	% which fruited	43.3	12.8	17.9	4.0	35.3	10.8
All flushes	No. of Inflrs	217	369	505	659	821	959
	% which fruited	38.7	11.4	17.2	6.4	33.0	9.9

TABLE 3—PERCENTAGE OF INDIVIDUAL FLOWERS WHICH PRODUCE FRUIT

		Varieties of Sweet Oranges					
		Pineapple		Hamlin		Valencia	
		Type of inflrs.		Type of inflrs.		Type of inflrs	
		Leafy	Leafless	Leafy	Leafless	Leafy	Leafless
First flush	No. of Flowers	484	517	1505	1455	2389	1568
	% which fruited						
	April 26	40.9	16.1	31.0	18.9	8.8	3.4
	Oct. 21	8.7	2.7	4.7	2.5	8.4*	8.2
Second flush	No. of Flowers	556	818	769	405	1171	1117
	% which fruited						
	April 26	28.1	12.5	31.3	18.0	9.0	7.4
	Oct. 21	11.0	3.8	3.8	1.2	7.4*	4.0
All flushes	No. of Flowers	1040	1335	2274	1860	3560	2685
	% which fruited						
	April 26	34.0	13.9	31.1	18.7	8.8	5.4
	Oct. 21	9.9	3.4	4.4	2.3	8.1*	3.5

* Sept. 1

on the average 1.3 times the number of flowers produced by the leafless type, and each flower had 2.9 times greater chance of bearing a fruit. Thus the total advantage of purely "new wood" bloom over purley "old wood" bloom would result in (1.3 x 2.9) 3.8 times more fruit. Similarly, in the Hamlins and Valencias used in this study the advantage of the bloom on leafy inflorescenes was 3.0 and 3.7 times respectively.

It remains to be shown what factors influence the type of bloom produced by an orange tree and what specific cultural practices can best be employed to shift the type of bloom in the direction of more numerous leafy inflorescences. Even in groves in which there is a relatively high percentage of leafy bloom, such as the one used in this study, it appears that the crop could be considerably increased if only a slight shift of leafless inflorescences to the leafy type could be brought about. In groves in which the bloom is almost all of the leafless type a shift to a predominantly leafy type would result in a very large increase in fruit production.

It should be emphasized that the results of the above study apply only to the sweet orange. A similar study is now in progress on the flowering and fruiting habit of the grapefruit and tangerine, which may or may not behave like the sweet orange.

TRANSPLANTING LARGE CITRUS TREES

(Continued from page 16)

ter.

The amount that the top will have to be cut back will depend upon the extent of the root system moved and the care taken in moving. If only a comparatively small root system is moved it is well to cut the top back to a framework and protect the limbs from sunburning with whitewash. Where it is desired to move numbers of trees an automobile wrecking crane mounted on a truck is very convenient or a simpler crane may be devised that can be attached to the trunk of the tree, with the bark protected by padding. As soon as the digging is completed the tree can be lifted and a tarpaulin or large burlap covering wrapped around the roots and the trees moved quickly to the new location. It is easy to back the truck up to the new hole and let the tree down and hold it at the proper level while the dirt is being filled in.

NEW PACKING MACHINE FOR MECH BAGS

A new machine, simple in design and construction, designed to automatically pack and weigh "consumer unit" cotton mesh bags of Florida oranges and other citrus has been in use at the packing house of Orange State Groves at Zellwood for the past season.

Sam Coen, owner of the packing house, said the device, designed along ideas and plans originated by John Kirkland of Lakeland, had been given a "thorough workout" and had proven effective, economical and practically foolproof.

This machine and its successful trials over a period of weeks climaxed several years of experimentation in an effort to find something better than the hand-packing and weighing of the bags to meet the growing demand for "consumer units."

Some New Citrus Varieties

Donald J. Nicholson, proprietor of the Royal Purple Research Nurseries at Orlando, a well known research worker and developer of several new varieties of citrus fruits, has just completed the development of a new pink grapefruit which fruited for the first time in 1944, and which he calls "Nicholson's Crimson Grapefruit". The fruit was developed from the Foster Pink grapefruit and the seed first planted about 1934. Mr. Nicholson has been working on the variety ever since. The fruits are large, well shapped and with flesh of a rich strawberry color, which frequently shows through the rind.

Among his other late developments are the "Roosevelt Early Orange," a seedless orange of large size; the "Winston Churchill Early Orange," a sister tree of the "Roosevelt" variety; and the "John R. Winston Early Grapefruit," named in honor of Mr. Winston's long and successful work with the U. S. Department of Agriculture, who has done much toward the improvementof flavor and quality of citrus fruits.

Mr. Nicholson states that these new varieties are not on the market, but that he has developed them along with his other research work in trying to see just what can be done in the way of producing new varieties and improving the quality of those already commercially grown.

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The rate for advertisements of this nature is only five cents per word for each insertion. You may count the number of words you have, multiply it by five, and you will have the cost of the advertisement for one insertion. Multiply this by the total number of insertions desired and you will have the total cost. This rate is so low that we cannot charge classified accounts, and would, therefore, appreciate a remittance with order. No advertisement accepted for less than 50 cents.

FOR SALE— ONE 20-H.P. Farquhar Locomotive Type Boiler in good condition. Garland C. Norris. P. O. Box 692, Lakeland, Florida.

FOR SALE — 35,000 ft. 8-5/8" OD 21.31 L. W. Line Pipe in 40-ft Lengths. P. E. Beveled, used but in excellent condition.
UTILITY & INDUSTRIAL SUPPLY COMPANY
921 East Michigan Ave. Jackson,Mich.

NOW BOOKING orders for raising citrus trees on sour or lemon stock. John Grislop Nursery, San Antonio, Florida.

CITRUS TREES—Best quality usual varities on sour orange or rough lemon stock. Robt. P. Thornton, c/o Clay Hill Nurseries Co., Box 2880, Tampa, Florida.

WAIT for the highly improved SEEDLESS PARSON BROWN ORANGE. Average seed content per fruit ½ half; most of the fruits entirely seedless. Extermely heavy bearing strain. Ripens as soon as Seedy Parsons. Place your order for trees NOW. No orders filled until 1947. Price $2.00 per bud. No orders accepted less than 500 trees. $10.00 per tree in lots of no less than ten trees for stock purposes for large growers wishing to bud their own trees.
ROYAL PURPLE CITRUS RESEARCH NURSERY
Orlanod, Florida Phone 5467

COMPLETE Packing House equipment for sale. Two car load capacity. N. E. McConaghy, Satsuma, Alabama.

BETTER BE Safe Than Sorry — you can't be too careful in selecting for future Citrus plantings. Highly improved Seedless Grapefruit, Seedless "Round" Oranges and patented "Dream" Navels fill the need for the early market. WE NEED BADLY, IMPROVED EARLY SEEDLESS CITRUS VARIETIES. Now we've got 'em let's use 'em. We are headquarters for four New Honey Oranges; Bombay, Florida Honey Orange, Golden Honey Orange and Chinese Honey Orange. Also four high-grade SUMMER Oranges; Eola, Von Werder, Clermont and Summer Tangerine-Orange which seasons run from May into September. These are all valuable fruits certain to make you money.
ROYAL PURPLE CITRUS RESEARCH NURSERY
Orlando, Florida Phone 5467

THERE Is A Great Future for highly improved seedless Grapefruit of extremely early maturity. We have it. WINSTON'S EARLY SEEDLESS GRAPEFRUIT — a brand new fruit ripening late August or earliest September, heavy in juice, sweet and delicious at early maturity. Never been sold. Premium prices paid for high grade sweet seedless early grapefruit. Should be a real bonanza. Quit fumbling—get on the band wagon. No sales until 1947—just warning you to wait for THE BEST, Get in on the ground floor— order ahead.
ROYAL PURPLE CITRUS RESEARCH NURSERY
Orlando, Florida Phone 5467

WANTED TO BUY — REAL ESTATE — My wife and I desire ten (10) acres or more citrus grove plus additional acreage and home or homesite. Immediate possession not required. Furnish full particulars. Cash or mortgage as you desire. N. W. Oppenheim 155 Humes Place, Memphis 11, Tenn.

ATTENTION NURSERYMEN AND LARGE GROWERS—New and improved highly developed ROOTSTOCKS superior to Rough Lemon or Sour Orange. The SCARLET LIME rootstock is drought, cold and disease-resistant; powerful root system. Grows equally well on heavy or very light soils. Initial crops produced are heavy and quality exactly like fruits on old trees. Buds fruit very early on this stock and matures earlier, STOVIN'S HYBRID LEMON has proved a remarkable stock for all varieties of Citrus. This stock is scabless, highly frost and drought-resistant and entirely free of gum or bark diseases. Grows vigorous buds and fruits quickly. REPARED SOUR ORANGE, is a vigorous and powerful grower—was developed from a selection of 75 different types of sour oranges. 3-year-old Reppard sour seedlings twice as large as ordinary sour seedlings. 90% of the plants in seed beds grow vigorously. Plants year old have stocky, buddable trunks. Few spindling plants in seed beds; grows well in dry soil. Reppared Sour Orange stock will probably equal rough lemon growth on high, thin soils, producing top-quality fruits. 10 buds and privilege, each variety $200.00.
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